stresses in reinforced concrete beams and columns; in the case of beams of rectangular and T section, flexure formulæ are deduced, based on the assumption of linear variation of the compression of the concrete for working loads; and for rectanglar beams on the assumption of a parabolic variation of this compression for ultimate loads, in both cases neglecting the tension in the concrete; examples are fully worked out to illustrate the use of these formulæ. A considerable amount of lengthy arithmetical work is necessary in using these formulæ, and a series of diagrams has been prepared, published on pp. 213—223, by means of which problems may be solved with rapidity and with a degree of accuracy quite sufficient for all practical purposes. These diagrams are at the end of chapter vi., in which the authors have collected together into a convenient form for reference all formulæ deduced in the earlier chapters of the book. Any engineer or architect who did not wish to check the accuracy of these formulæ or to become familiar with the principles upon which they are based, but merely desired to apply the results directly to some problem of design, would find everything he wanted in a compact form in the forty pages of this chapter.

Since T beams are often continuous over their supports, and since at such points there is a negative bending moment throwing the flange into tension and the lower part of the web into compression, a system of double reinforcement must be adopted in such cases, and this problem is fully worked out, as is also the problem of computing the stresses when the resultant of the external forces acting on the one side of the section of a beam is not parallel to that section. The remainder of chapter iii. is devoted to a discussion on the shearing stresses in reinforced beams, and to the strength of reinforced columns; as the authors point out, in ordinary construction the ratio of length to least width seldom exceeds 15, hence they have dealt with the problem simply as one of short columns.

In chapter iv., the results of a large number of tests of reinforced beams and columns are given, including many tests carried out by the authors themselves; not only are the actual numerical results of these tests of importance, as they afford the only safe test of the accuracy of the formulæ used in their design, but also much valuable information in regard to the design of such reinforced members may be gained from a study of the way in which the final collapse takes place; several plates are given, reproductions of photographs of the fractured beams, which show clearly how the disposition of the reinforcing bars in the beam influences the manner in which it gives way when the destructive load is reached.

In the next chapter the working stresses which can be permitted with this material are fully treated, and such constructive details as the use of steel of high elastic limit, the durability of the material, and its power of resisting the effect of fire. In the last three chapters a number of practical details in reinforced concrete work is given, and the problem of the determination of stresses in arches is dealt with in a very neat and compact fashion.

T. H. B.

THE EVOLUTION OF DRESS.

The Heritage of Dress, being Notes on the History and Evolution of Clothes. By W. M. Webb. Pp. xxvi+393. (London: E. Grant Richards, 1907.) Price 15*s*. net.

THERE was certainly room for a scientific account of the evolution of dress. The present book, however, which professes to be "a popular contribution to the natural history of man," is hardly more than a collection of curious survivals in modern fashions, uniforms, the dress of the Court, the Church, the Bar, and other learned and official personages. The bibliography consists largely of articles in magazines and newspapers, and the author seems to have little acquaintance with the scientific literature of the subject, such as the frescoes of the Minoan Age unearthed by Mr. A. J. Evans; the contributions of Mr H. Balfour, Mr. Skeat, Dr. Westermarck, and Dr. Haddon on the evolution of ornament; Prof. Ridgeway on the penannular brooch; Dr. J. G. Frazer's classical paper on mourning as a disguise to baffle the ghost. He appears not to have read even such popular works as those of the late Mr. Elworthy on the "Evil Eye" and "Horns of Honour."

But if Mr. Webb has not written a scientific treatise on the "Heritage of Dress," he has given us, within its limits, an interesting and suggestive book, provided with excellent drawings which really illustrate the many topics with which he attempts to deal, and with an index which, if not quite accurate, is still sufficiently comprehensive. His aim is to furnish a record of survivals, and perhaps in no department of modern life are these more numerous than in that of dress. It is a fact of much scientific importance in connection with the history of social development that so many details in modern costume which we are inclined to believe capricious or accidental, due to the inventive genius of the tailor or the milliner, are really traceable to primitive forms, and that the perpetual changes of fashions are the result of a process of evolution, advancing on conservative lines, in which the influence of early ideas is apparent.

This can be readily illustrated from the wealth of material supplied by Mr. Webb. Thus perhaps the earliest form of dress is the shawl or wrapper, the fringes of which in the modern examples date back to the most early kind of loom. From this are derived the jacket of the woman as well as the trousers of the man. It is more hazardous to trace the shape of the hat to that of the primitive hut; but the band on our silk hats and "bowlers," now purely ornamental, is almost certainly a relic of the fastening of the original cloth headdress.

The origin of liveries, which represent the costume of the wearers' masters in earlier times, is equally curious. When we come to uniforms, almost all their distinguishing features have a history as survivals. The red coat took its colour from that of the best coat in the days of Charles II., and it has thus naturally descended to the fox-hunter and golfer; the baton of the field-marshal is the box in which he used to carry the orders of his sovereign; the epaulettes of the Imperial Yeoman take us back to chain-mail; the

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"prickers" of the hussar to the old flint-lock musket. Putties, which Mr. Webb traces back to Anglo-Saxon times, are proved by recent discoveries to be as old as the Mycenæan culture.

Much, of course, still remains mysterious. Why has a man's coat its buttons on the right, that of a woman on the left? Is the cockade descended from the chaperon headdress of the time of Richard II.? Whence come the buttons on the jacket of the page and on the trousers of the costermonger? Can it be, as Mr. Webb suggests, that grooms weave straw in the manes of horses because the horse was once thought to be a corn-spirit? Such matters require for their solution a wider range of induction and a more scientific study of the evidence than is provided by the present book, which raises, if it fails to solve, many other curious problems of the same kind.

MODERN VIEWS OF ELECTRICITY.

Modern Views of Electricity. By Sir Oliver Lodge, F.R.S. Third edition, revised. Pp. xvi+518. (London: Macmillan and Co., Ltd., 1907.) Price 6*s*.

WHEN Sir Oliver Lodge decided to issue a new edition of his well-known treatise, he set himself a very difficult task. The first edition was published in 1888, the second in 1892; he might well have thought that the development of the science during the past fifteen years had been so rapid that nothing short of complete re-writing could render the book deserving of its title. However, he has concluded that, since recent progress has amplified our views of electricity rather than altered them, the treatise has not lost its value; that it is still an expression of the truth, though it may be only a partial expression. Accordingly the general plan of the third edition is the same as that of the first; the changes that have been made consist of a few minor alterations and omissions, together with the addition of six appended lectures.

The earlier editions are so familiar that no detailed comment is necessary. Electrostatic, conductive, and magnetic processes are described and illustrated by a series of mechanical analogies, leading up to the representation of the electromagnetic ether as a medium made up of elastically connected gear wheels, separated in some regions by surfaces of slip. In the elaboration of these analogies the author is seen at his best; everything that he writes is extremely suggestive, though some students may be puzzled by the inconsistency between the different illustrations that are used in different parts of the book to represent the same action. We would direct special attention to the admirable treatment of the magnetic effect of materials with a permeability greater than unity.

However, we think that the author has underrated somewhat the change in even the simpler parts of the work, which has been necessitated by recent discoveries. It is true that these discoveries have affected our views of the electric properties of matter rather than the properties of electricity itself, but all electrical experiments involve the use of material bodies. Thus the discovery of the great difference between positive and negative electricity invalidates Sir Oliver Lodge's representation of the magnetic field. He can no longer account for the negative result of Maxwell's attempt to find a finite angular momentum in a closed current circuit by the existence of two oppositely directed streams of positive and negative electricity; there must be a gyrostatic effect, though it is too small to be detected by any arrangement devised at present.

Again, our view of the effect of a material dielectric on electrostatic phenomena has changed completely. It is not believed now that the presence of sulphur alters the properties of the lines of force issuing from a neighbouring charged body; the effect of the sulphur on electrostatic actions should be represented in the same way as the effect of iron on magnetic actions. The view that all electric actions take place in the medium surrounding a charged body and not in the body itself has been modified; attention has been concentrated once more on the importance of the conception of a charge. It is misleading to speak of the dispersion of light as obscure and to suggest that it has no causal connection with selected absorption. The old view that a dielectric resists the passage of a current but may be "broken down" by a force sufficiently great suggests that a perfect vacuum devoid of all resisting matter should be a perfect conductor, and is utterly discordant with modern views. If the author did not see his way to re-write the book completely, we think that at least he should have added copious notes on these and many similar points to warn the student that the older statements must be revised in the light of later knowledge. As it stands, the book is of immense interest to those to whom modern conceptions are familiar, for it enables them to grasp at once the bearing of those conceptions on fundamental problems, but it would be dangerous in the early stages of reading.

We have detected one misprint on p. 224, l. 24: for "infinite" read "finite." We must also protest strongly against the use on p. 255 of the expression "centre of gravity of the ether" in place of "centre of mass." There is no evidence whatever that ether has a centre of gravity.

N. R. C.

ENGLAND AN EXAMPLE FOR GERMANY.

Der naturwissenschaftliche Unterricht auf praktisch-heuristischer Grundlage. By Dr. F. Dannemann. Pp. xii+366. (Hanover and Leipzig: Hahnsche Buchhandlung, 1907.) Price 6 marks.

WE are accustomed in matters relating to school teaching to have German methods and results eulogised by contrast with our own, so that it is especially gratifying for once to find the tables turned. The author is a leading exponent of science teaching in his country, a schoolmaster of high repute in secondary schoolwork, and he has written this elaborate work frankly on the model of teaching that he witnessed at Harrow and other English secondary schools; and he has produced an account which in some respects is more thorough and comprehensive than anything we have in England. The only work to compare with it is the American book by Smith and Hall which appeared two years ago, and that deals only with chemistry and physics, while Dr. Danne-

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